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A COMMENSAL POLYNOID WORM FROM CALIFORNIA

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In the course of an ecological reconnaissance of Elkhorn Slough, Monterey County, California, Mr. G. E. MacGinitie of the Hopkins Marine Station found a very fascinating association of four species living in the mud of the shallow flats characteristic of that locality. These four species belong to widely different groups, viz., one to the Echiuroidea, one to the Polychæte family Polynoidæ, one to the crabs, and one to the bony fishes. Two of these species were known to science, viz., the crab (Scleroplax granulata Rathbun), and the fish (Clevelandia ios Jordan & Gilbert). The remaining two proved to be new. The echiuroid has since been described as Urechis caupo by Dr. W. K. Fisher of Hopkins Marine Station and Mr. MacGinitie,1 who have also given an account of the ecology of the association. They also included in their paper a brief description or diagnosis and a figure of the Polynoid worm. The present paper describes the species in greater detail and gives 17 figures showing structural characters. No information is given in this paper as to the behavior of this animal, reference being made to the account of Fisher and MacGinitie.

¹ Annals and Magazine of Natural History, Tenth Ser., Vol. 1, No. 2, pp. 204-213, pl. 10, February, 1928.

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The taxonomy of the family Polynoidæ is in several respects very unsatisfactory. Most of the species are described in a superficial manner and the principles of the generic subdivision are very uncertain and inadequate. A large number of genera have been established, but very little has been done in the way of their critical evaluation and delimitation. Some authors appear to be inclined to accept most of these genera, while others prefer to lump many of them into more comprehensive units. For instance, Bergström (Die Polynoiden der schwedischen Südpolarexpedition 1901-1903, Zoologiska Bidrag, vol. 4, Uppsala, 1916) includes in the genus Harmothoë Kinberg the entire genera Hermadion Kinberg, Lagisca Malmgren, Evarne Malmgren, Parmenis Malmgren, Eunoa Malmgren and parts of the genera Polynoc Savigny, Antinoë Kinberg, and Lanilla Malmgren. On the other hand, Chamberlin (The Annelida Polychæta, Mem. Mus. Comp. Zool., Harvard College, Cambridge, Mass., 1919) recognizes all these genera as valid.

Lacking a sufficiently wide experience to pass a critical judgment on the relative merits of these opposing views, I have decided to accept, tentatively, Bergström's wide conception of the genus *Harmothoë* and have referred my new species to this genus.

Harmothoë adventor Skogsberg²

Diagnosis: Body depressed; ratio between length and width, 2.7 – 3.4:1; maximum length, about 40 mm. Number of somites, 37 or 38. Anus on pygidium. Elytra cover body completely, or mid-dorsal portion of body naked, 15 in number, present on somites II, IV, V, VII, and on alternate somites to XXIII inclusive, and then on XXVI, XXIX, XXXII; smooth, with moderate number of rounded tubercles along edge. Prostomium 1.4 – 1.7 times longer than wide, with two small, mammilliform anterior processes, which sometimes are nearly absent. Two pairs of eyes of moderate size on posterior half of prostomium. Median tentacles about twice as long as lateral tentacles, subequal in length to prostomium. Dorsal cirri long. Tentacles, palpi, and cirri with minute papillæ. Each notopodium and neuropodium

² Skogsberg in Fisher & MacGinitie, Ann. Mag. Nat. Hist., Tenth Ser., Vol. 1, No. 2, p. 213, pl. 10, fig. 3, February, 1928.

near middle of body with 50-100 bristles all with simple tips and distinct pectination; notopodia, as well as neuropodia, with two kinds of bristles. Some of notopodial bristles stronger than neuropodial, with strong tips; others weak, with thread-like tips. Some of neuropodial bristles with pectination along distal $\frac{1}{4} - \frac{1}{6}$ and with strong tips; others with pectination along distal $\frac{1}{2} - \frac{1}{3}$ and with thread-like tips. Each somite with dorsal crossband of pigment.

Description: Greatest length recorded in preserved specimens, 40 mm., exclusive of prostominal and anal appendages. The large specimens usually very heavily built, somewhat more so than the smaller ones. Body widest at, or somewhat in front of, the middle, tapering usually somewhat anteriorly and posteriorly, but some specimens are subuniform in width nearly throughout; anterior and posterior extremities well Ratio between length (measured as above) and rounded. greatest width of body (between tips of parapodia, exclusive of bristles), 2.7 - 3.4 : 1: relatively wide and narrow specimens are found among the large sizes. Somites 37 or 38, exclusive of the pygidium; the somite next to the pygidium quite small (fig. 2) with small and weak parapodia, cirri, and bristles: the somites in front of this gradually increase in size the farther anteriorly they are located, but the notocirrus of the next but last somite is usually quite large, three times or more length of corresponding structure of last somite. elytra may cover the body completely; often, however, the two members of each pair are barely in contact with one another; or a zone about half as wide as an elytron along mid-dorsal line may be naked. In all the specimens recorded the prostomium was completely covered by the first pair of elytra; and the anus, which is located dorsally at the anterior end of the pygidium (fig. 2), appears always to be covered by the last pair of elytra.

The prostonium (measured from tips of anterior processes) is about 1.4-1.7 times longer than wide, widest at or near the middle, with well-rounded lateral sides, and with quite small, mammilliform anterior processes of varying size. In some specimens these processes are so reduced in size that they can hardly be distinguished; those represented in figure 1 were the largest seen. When well developed, they are

about as long as wide and rounded distally. The prostomium is split anteriorly by the ceratophore of the median tentacle which begins at or somewhat in front of the middle; behind the ceratophore its surface is usually almost evenly vaulted, without a distinct mid-dorsal groove. There are two pairs of eyes of moderate size on posterior half of prostomium, the members of each pair being far apart; anterior pair sometimes somewhat larger than the posterior. Ceratophore of median tentacle about as long as prostomium or somewhat shorter. about half as wide as long or somewhat narrower, widest in front of middle where its sides are well rounded. Median tentacle tapers gradually distally and is about twice as long as prostomium or somewhat longer. Ceratophores of lateral tentacles of moderate size, about half size of ceratophore of median tentacle or somewhat less. Lateral tentacles subuliform and about half as long as median or somewhat less.

Palpi about twice as long and thick as median tentacle or somewhat less and of about same shape as this but constricted proximally.

The proboscis when fully everted, is cylindrical and about twice as long as wide or somewhat more or less, bearing along its anterior edge 18 papillæ, 9 of which are dorsal and 9 ventral. These papillæ (fig. 9) either subequal in size, or those near median plane somewhat larger than lateral ones; seen from the outside, these papillæ appear to be conical and each has on the inside a rather large rounded triangular process. Two pairs of fairly large, subequal, triangular, brown, chitinous teeth (fig. 8) in the mouth, one dorsal and one ventral pair, the two members of each pair located close together on either side of median plane; laterally to and connected with each of these four teeth, is a chitinous plate, the outer edge of which is free and apparently cutting.

Parapodium of first somite (fig. 1) somewhat shorter than prostomium is wide and about twice longer than wide; anterodistally it has a small, mammilliform process, shorter than ½ of width of parapodium and lacking distal bristles. (This process undoubtedly corresponds to one of the tips of the parapodium, probably to the tip of the notopodium, since it contains an aciculum.) Free ends of cirrophores of the two cirri about as long as wide; the two cirri about same shape as

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median tentacle, the dorsal one about as long as the palpi, the ventral somewhat $(\frac{1}{4} - \frac{1}{3})$ shorter. Dorsal cirri present on the following somites: III, VI, VIII and on alternate somites to XXIV inclusive, then on XXV, XXVII, XXVIII, XXX. XXXI, XXXIII, XXXIV, XXXV, XXXVI, and XXXVII; these cirri (fig. 1) about same shape as those on first somite: most of them subequal in size, sometimes even slightly longer than greatest width of body (exclusive of bristles), sometimes decidedly less; a few of the anterior and posterior may be somewhat shorter, and the one of somite XXXVII (fig. 2), as previously noted, quite short. Each of these cirri has a subconical cirrophore, quite short in comparison with the cirri, and about twice as long as wide or frequently even somewhat shorter; ventral cirrus of second somite somewhat different from the other ventral cirri, its cirrophore directed more or less anteriorly, about half as long as dorsal cirrus of first somite or somewhat less: most of remaining ventral cirri (fig. 10) subuliform, somewhat shorter than the one of the second somite, about 1/3 as long as the parapodium to which they belong or slightly less. Tentacles of prostomium, palpi, and all the cirri furnished with minute, mammilliform papillæ: on the ventral cirri these are quite few; in case of remaining structures, they are more or less numerous.

All the neuropodia (fig. 10) of same fundamental shape; subcylindrical in ventral view, their distal half slightly narrower than the proximal; obliquely truncate postero-distally, and furnished antero-distally with a flattened, mammilliform process about half as long as average width of neuropodium in ventral view; seen from behind (figs. 11, 12), this process either triangular or truncate triangular. In the middle of the body the neuropodia are about as long as the body proper is wide or slightly shorter, and about 0.30 as wide as long in ventral view. Anteriorly and posteriorly the neuropodia gradually decrease in size, the most anterior and posterior ones also being somewhat wider relatively. Notopodium (fig. 11) quite small, distinctly shorter than width of neuropodium, about as long as wide, more or less obliquely truncate distally, and dorso-distally furnished with a narrow peg-like appendage, about as long as rest of notopodium. Of the two acicula, the one of the neuropodium ends near the point of

the flattened antero-distal portion; the one of the notopodium ends at the tip of the peg-like appendage.

Notopodium (fig. 12) with a large but varying number of closely set bristles, arranged as in a brush, gradually increasing in length the more ventrally they are placed; ventral bristles reaching to or slightly beyond tip of neuropodium, the dorsal ones about half as long or slightly less. The number of bristles in the notopodia near the middle of the body varies from about 50 to about 100, the number gradually increasing with the size of the specimens; in fairly large specimens (35 – 40 mm.) these notopodia have usually 70-80 bristles. Of these bristles, the dorsal ones (about ½ to ¾ of the total number) are nearly straight or but gently curved, narrowly lanceolate, their distal 1/2 or 1/3 furnished with closely set cross-rows of short, fine spines which end a short distance from the strong, simple tip of the bristle (fig. 14). The ventral bristles (fig. 15) usually are gently or moderately curved, ending in a fine, hair-like tip, and furnished along their distal 1/2 to 1/3 with a dense series of fine, short spines and at least sometimes with cross-rows of exceedingly small spines very difficult to detect. The neuropodium has also a large and varying number of bristles but these, generally speaking, are arranged in a narrow, dorso-ventral plane. The number of bristles in the somites referred to above is usually between 70 and 80, the lowest number counted was 58, the highest 84. Just as in the notopodium there are two kinds of bristles; the dorsal ones (about 1/3 of the total number) issuing along the dorsal 1/3 of the neuropodium; and the ventral ones situated near the tip. The dorsal ones (fig. 17) are quite long as a rule, about 1/2 the length of the neuropodium or even more, gently curved, with fine, nearly thread-like tip, and furnished along the distal $\frac{1}{2} - \frac{1}{3}$ with moderately strong, closely set pectinae. The ventral bristles (fig. 16) gradually decrease in length the more ventrally they are situated; the most dorsal of them are about half as long as the neuropodium or somewhat less; the most ventral only about $\frac{1}{2} - \frac{1}{3}$ of this length; their distal 1/4 - 1/6 is distinctly set off from the proximal part, has a gently curved, strong, simple tip and, dorsally, a closely set series of moderately strong pectinae ending at some distance from the tip. The bristles of the neuropodium are more slender than the lanceolate bristles of the notopodium.

The cirri of the pygidium have the length, shape and structure of the longest dorsal cirri of the parapodia or they may even be somewhat longer.

The preelytrophores (a term to designate the dorsal processes just inside the cirrophores on the segments lacking elytra) are small on the third somite (fig. 1), fairly large on the sixth somite, and increase gradually in size to a point somewhat behind the middle of the body, from where they decrease posteriorly. When typically developed, they are narrowly mammilliform, frequently of about the same shape and direction as the cirrophores but slightly smaller than these.

The nephridial papillæ (fig. 10) frequently are rather large, 2-3 times longer than wide, and rounded distally; sometimes distinct on every somite from somite VI to somite XXXVI; sometimes only from somite VIII to XXXV.

As previously noted, the elvtra are well developed and are present on all the somites which do not have cirri; all of them deciduous, i. e., they very readily fall off, and have along the margin a moderate number of tubercles (of the "Kugel-Typus"), each furnished at the tip with one or a few short, fine, hair-like processes (fig. 13); their surface is, for all practical purposes, smooth; only a few small scattered tubercles may be found. The first elytron (fig. 3) is rather small, broadly ovate, flattened antero-laterally; the second (fig. 4) and third (fig. 5) are asymmetrically kidney shaped, being strongly concave anteriorly; the fourth (fig. 6), which is between two and three times larger than the first, is also asymmetrically kidney shaped, but the anterior concavity is less pronounced; the fifth (fig. 7), which is still somewhat larger, is subovate in outline and flattened antero-laterally; the remaining ones agree fairly well with the fifth, are rather large in the anterior 2/3 of the body, and decrease somewhat in size in the posterior 1/3 of the body. All elytra vary somewhat in shape.

Median tentacle fairly light gray-green except near tip where there is no pigmentation. Lateral tentacles fairly dark brown with unpigmented tips; palpi lack pigment or nearly so: cirri of first somite and ventral cirrus of second somite about same color as the median tentacle; most of the dorsal cirri have a zone of gray-green near tip; ventral cirri unpigmented or nearly so; ventral side of body unpigmented, the mid-ventral zone and the region around the mouth richly blood colored, evidently due to the transparency of the skin: dorsum with fairly broad, gray-green cross-bands, one on each somite, extending onto the preelytrophores and sometimes onto the elytrophores. Proboscis but slightly pigmented. The first elytron is light gray, except along the antero-lateral edge . which is unpigmented. Of the other elytra, those on the anterior half of the body have a light gray band along posterior edge but otherwise unpigmented; the ones on the posterior half of the body are nearly unpigmented. Pigmentation somewhat variable.

Type: No. 633, Mus. Calif. Acad. Sci., collected by G. E. MacGinitie on the shallow mud flats in Elkhorn Slough, Monterev Co., California.

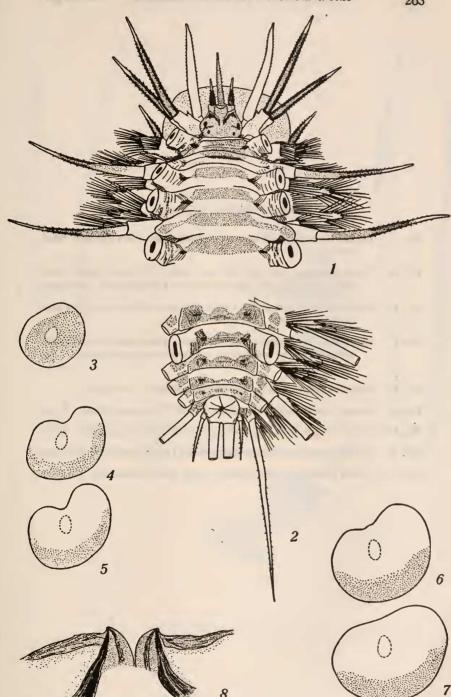
Remark: The specific name adventor refers to the peculiar mode of living of this animal. It means, the guest at an inn. It may be noted in this connection that the specific name of the Echiuroid, with which this species is associated, means innkeeper.



Harmothoë adventor Skogsberg.

- Fig. 1. Anterior portion of body from dorsal side. Proboscis partly everted.

 Stippling indicates pigmentation. Bristles greatly reduced in number and very diagrammatic. Type.
- Fig. 2. Posterior portion of body from dorsal side. Shows small size of posterior somites and position of anus. Stippling indicates pigmentation. Most cirri represented only by their cirrophores. Bristles, especially of anterior somites, reduced in number and very diagrammatic. Not type.
- Figs. 3-7. First, second, third, fourth and fifth left elytra. Pigmentation indicated by stippling. Type.
- Fig. 8. A pair of teeth from mouth. Thickness of chitin indicated by relative darkness. Not type.



Harmothoë adventor Skogsberg.

- Fig. 9. Papillæ along anterior edge of proboscis, seen from different sides. Not type.
- Fig. 10. Three parapodia from left side near middle of body; ventral view.

 Bristles greatly reduced in numbers and diagrammatic. Not type.
- Fig. 11. Right 20th parapodium from behind, with bristles omitted, but with acicula indicated. Not type.
- Fig. 12. Right 16th parapodium from in front. Preelytrophore indicated. Bristles greatly reduced in numbers and diagrammatic. Not type.
- Fig. 13. Edge of an elytron to show marginal tubercles. Not type.
- Fig. 14. Dorsal bristle from notopodium of right 19th parapodium. Type.
- Fig. 15. Ventral bristle from notopodium of right 19th parapodium. Type.
- Fig. 16. Ventral bristle from neuropodium of left 15th parapodium. Not type.
- Fig. 17. Dorsal bristle from neuropodium of left 15th parapodium. Not type.

